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Examples of Relationship between different forms of life in Tropical Africa

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(With three plates)

INTRODUCTION

Every form of life necessarily involves some relationship with other forms of life, and the problem[1] posed by the Bombay Natural History Society has to be clearly defined. It appears to me that the point of the inquiry is a review of cases where a species which is not really a parasite habituates itself to use the activities of another species for its own benefit, for its security, or for food, or for shelter.

Relationships of this sort are certainly much more numerous than we know of, especially in the tropics where animal communities are more intricate and have been less intensively studied. In comparison with other tropical countries, India has a tradition of interest and efficiency in the study of natural history. Hence, several cases of such relationships were first established in that country. Nevertheless, such relationships may be observed anywhere and I propose, in the present

[1] This article was written in response to a letter from the Honorary Secretary to members of the Society asking them to record their observations on animal associations.

paper, to record briefly some observations on this subject recently made by me in tropical Africa.

Association of the Bat *Kerivoula harrissoni* with the social spider *Agelena consociata*

When I was staying at the French 'Mission biologique au Gabon' I was told by a fellow member, a specialist in spiders, that he had rather frequently observed some creature, either a small bat or a large moth, well inside the webs made by colonies of the social spider *Agelena consociata*—not being particularly interested he was not sure of the identity of the intruder. I verified the information and readily identified the intruder as the bat *Kerivoula harrissoni*, a small forest species. Later, I collected several specimens of the bat from other such webs and, further, I never saw the species in another type of diurnal roost.

Kerivoula harrissoni is neither solitary nor colonial in its habits. It seems to lead a family life, something that is rare among the numerous species of bats. Regularly we saw pairs in the webs, and sometimes a young one as well. The bats do not attach themselves to the webs, but they hang by their hind limbs from the twigs which support the webs. My friend Gerard Dubost, who was with me in Gabon, noticed that where the bats were hanging the bark of the twigs had been worn by their claws, a fact which suggests very sedentary habits on the part of the bats.

We observed no direct interference between the two species, the bats and the spiders, in their day to day life. It seems probable that the webs provide the bats with protection against predators and against the sun, particularly by reason of the dry leaves that the webs support. That dry leaves are an important factor of the diurnal biotope is suggested by the fact that the Indian Painted Bat of the same genus, *Kerivoula picta*, has been observed hanging during the day in bunches of dried leaves.

Generally speaking, bats of the genus *Kerivoula* are known to occupy rather unusual diurnal shelters. For instance, the African species *K. lanosa* and *K. nidicola* shelter in the nests of birds such as weavers and sunbirds. But this is the first record of a bat having its diurnal roost in a spider's web.

Brosset : Animal Associations

Kingfisher *Alcyon badia* feeding its young at nest in nest of arboreal termite *Nasutitermes*.

(*Courtesy : Mission biologique au Gabon—Director, Professor P. P. Grasse. Photo : A. R. Devez*)

Brosset : Animal Associations

Hive of bees *Trigona nebulata* made in woodpecker incubation chamber in nest of arboreal termite *Nasutitermes* (outside view).

Arrow shows entrance of bees, made by narrowing exit hole of the birds.

(Courtesy : Mission biologique au Gabon—Director, Professor P. P. Grasse. Photo : A. R. Devez)

A SUCCESSION OF PARASITIC INTRUDERS IN THE NEST OF THE ARBOREAL TERMITE *NASUTITERMES*

While studying termites, the head of the Mission, Professor P. P. Grassé, discovered in a nest of the arboreal termite *Nasutitermes* a clutch of eggs of birds which we identified as of a kingfisher (genus *Alcyon*). Several members of the Mission became interested as various vertebrates and invertebrates seemed to be associated with the *Nasutitermes* nests. The phenomenon was specially studied by Roger Darchen and me and we were able to establish a curious succession of parasitic intruders in the termite nests, which were very often occupied first by birds, then by honey bees, and finally by ants.

Occupation by birds

After the original discovery by Professor Grassé, we found several other birds' nests made inside the arboreal nests of the *Nasutitermes*. Three were made by the same species of kingfisher *Alcyon badia*, one by another kingfisher *Alcyon malimbica*, another by the woodpecker *Campethera permista*, two others by the woodpecker *Campethera nivosa*. We also found several empty nests in *Nasutitermes* nests, probably made by the same species of birds.

Birds of the woodpecker family are well-sinkers, whereas kingfishers are borers of tunnels. Each species of birds followed its family technique in the termite nests; the woodpecker worked from the top sinking a vertical excavation, while the kingfisher bored a round incubation chamber with the exit hole on the side.

Two eggs are the normal clutch of the birds nesting in the termite nests. In two cases of woodpeckers and in one of kingfishers only one young one was reared. In three cases, in spite of the apparently secure situation of the nest, the clutch was destroyed by predators.

The most exciting problem is still met within India and concerns the nest of the Rufous Woodpecker *Micropternus brachyurus* made in the nest of the ferocious *Crematogaster* ants: How can this small bird hatch its eggs and rear its young in the middle of a crowded colony of these aggressive insects, in a situation which a large mammal would not be able to endure for more than a few seconds?

For the Indian woodpecker it seems that the problem remains unsolved. For the Gabonese species careful consideration makes the solution clear. In the nests of the African woodpeckers *C. nivosa* and *C. permista* the cells of the termite nest remain open and communication between the birds and the termites is possible through the